

Original Article

MEDICAL STUDENTS' PERCEPTIONS REGARDING ANTIBIOTICS USE AND ANTIMICROBIAL RESISTANCE IN EBONYI STATE, NIGERIA'

¹Ijeoma N Okedo-Alex, ¹Ugochukwu C Madubueze,^{1,2}Chukwuma D Umeokonkwo, ¹Ifeyinwa C Akamike,¹Department of Community Medicine, Federal Teaching Hospital Abakaliki Ebonyi State Nigeria²Nigeria Field Epidemiology and Laboratory Training Programme Asokoro Abuja Nigeria

ABSTRACT

BACKGROUND AND OBJECTIVES: Medical students as future doctors have important roles to play in the control of antimicrobial resistance. The aim of this study was to assess the perceptions of medical students regarding antibiotics use and antimicrobial resistance in Ebonyi State, Nigeria.

METHODS: A cross-sectional survey was conducted among all the 184 fifth and sixth year medical students in Ebonyi State University, Nigeria using semi-structured, self-administered questionnaires. Proportions, chi square and logistic regression were estimated with Epi Info version 7.2 at 5% level of significance.

RESULTS: Respondents were mostly males (62.5%), aged 20-29 years (68.9%) with 60.9% of them in final year. Majority (85.9%) had used antibiotics in the last one year. Most (78.3%) rated themselves to have adequate knowledge on antibiotic use and resistance but only 40.2% respondents had positive perception towards antibiotic use and resistance. Similarly, only 46.7% agreed that hand washing was important in controlling antimicrobial resistance. Majority (53.3%) believed that antibiotics were safe drugs and should be used commonly while only 50.5% disagreed with use of antibiotics as first line treatment for sore throat. Desire for more education on antimicrobial resistance and use was a significant predictor of positive perception (OR 0.36, 95% CI; 0.15-0.87; $P=0.024$)

CONCLUSIONS: There was poor perception towards antibiotic use and resistance in spite of the high rates of antibiotic consumption and self-rated knowledge on antimicrobial use. There is need for reorientation of medical students' perceptions towards antibiotic usage and the role of infection control in curbing antimicrobial resistance.

KEY WORDS: antibiotic use, antimicrobial resistance, perception, medical students, Nigeria

NigerJmed2019: 73 - 79

© 2019. Nigerian Journal of Medicine

INTRODUCTION

Antibiotic resistance is a growing problem worldwide, with a negative impact on patient outcomes and the economy at large.¹ Presently, antibiotics are one of the most commonly prescribed medicines in most developing countries including Nigeria.^{2,3} They are usually bought over-the-counter in Nigeria thereby leading to its indiscriminate use and increase risk of developing resistance.⁴ Studies have revealed a high rate of antibiotic consumption among university undergraduates in Nigeria and they usually obtain these

medicines without a physician's prescription.^{3,4} Irrational antibiotic use is a major reason for the increasing spread of antibiotic resistance.^{1,5} Between 20% and 50% of antibiotic use is either unnecessary or inappropriate,⁶ and decreasing it is a necessary first step to curb antibiotic resistance.

The prescribing behavior of medical doctors plays an important role in the consumption of antibiotics and is a potential tool for the control and containment of antibiotic resistance.⁷ Medical Students are future doctors as such they must be well prepared to use antibiotics more sparingly and appropriately.^{8,9} In addition, they are an important target group for sustainable antibiotics prescribing intervention programs. The World Health Organization (WHO) has recommended training for medical undergraduates regarding

Correspondence to: Dr. Okedo-Alex, Ijeoma,
Department of Community Medicine,
Federal Teaching Hospital Abakaliki Ebonyi State Nigeria
Email: ijeomaninadr@gmail.com,
Tel: +234 8064927291

the prudent prescription of antimicrobials.¹⁰ Despite this, medical education in Nigeria offers students specialized curricula in pharmacology and microbiology, but little or nothing on antimicrobial use and resistance. Therefore, one begins to wonder what the perceptions of these students are towards antibiotic use.

The aim of this study was to determine the perceptions of Nigerian medical students regarding antibiotic use and resistance. The results of this study may be useful to enable the implementation of more courses and training in antimicrobial stewardship for medical college students, thereby improving the future doctors' performances on antimicrobial prescription in hospitals.

MATERIALS AND METHODS

Survey setting and design:

A descriptive cross-sectional study was conducted among 5th and 6th year medical students of Ebonyi State University medical school, Nigeria. The medical school takes an average of 6 years before graduation/qualification as a medical doctor. Each class is denoted by the name of the year of study and is separated by examinations on the core courses taught in that year/class. These students have been taught and satisfactorily passed examinations on pharmacology and medical microbiology at the 4th year of medical school before qualifying to progress to the 5th year of study. Ebonyi State is located in the South-eastern part of Nigeria with Abakaliki as its capital city.

It has two universities namely; Ebonyi State University Abakaliki and Alex Ekwueme Federal University Ndufu-Alike Ikwo. Ebonyi State University was established in 1999 and is the only university currently training student doctors in the Ebonyi State and has produced several sets of doctors since its inception. As part of the training of medical students, they are exposed to teachings on medical microbiology and mechanisms of drug action and use (pharmacology) in the 4th year of medical school as this knowledge will serve as basis for their training in clinical medicine in 5th and final year. They are required to pass both written and oral examinations on these courses before they will be deemed fit to progress to the clinical classes as these teachings will form the

bedrock for their antimicrobial use and prescription when they become doctors. Study was conducted in April 2018 and as at this time, there were 112 and 72 medical students in the final and pre-final classes.

Study population and data collection:

Data was collected from one hundred and twelve 6th year and seventy-two 5th year medical students (100% response rate respectively). Information was collected using a semi-structured self-administered questionnaire adapted from previous studies.^{11,13} The first section of the questionnaire collected information on the socio-demographic characteristics of the students, previous use of antibiotics, self-rated knowledge on antibiotics and desire for more education on antibiotics, the second section assessed perception towards antibiotic use and infection control practices while the third section assessed perception towards personal antibiotic use.

Data was collected by the research team on a scheduled week day just before the first lecture for the day. The research team was made up of senior resident doctors in the department of Community Medicine, Federal Teaching Hospital Abakaliki (FETHA)

Data management/analysis:

The independent variables were socio-demographics (age, sex, class, ever been taught on AMR), use of antibiotics in the past year, frequency of use of antibiotics, self-rated AMR knowledge, desire for more AMR education. The perception questions were 5-point Likert questions whose responses ranged from "Strongly disagree" to "Strongly agree".

Each question had a total of 5 points with strongly agree having the highest score of 5 to strongly disagree having the least score of 1 however the reverse obtained for negatively structured questions. Total perception scores ranged from 11 to 55. A score of 75% and above overall perception score (41.25 points or more) was taken as positive perception while less than 60% constituted negative perception.

Epi-Info Version 7.2 was used for the data entry and analysis. Frequencies and proportions were calculated for categorical variables while means

and standard deviations were calculated for numeric/quantitative variables. Frequency tables were used to present the descriptive statistics of the variables and relevant means, standard deviations, and proportions were calculated. Chi square statistics was used for bivariate analysis. Analytical associations were considered statistically significant at $P < 0.05$.

Ethical considerations:

Ethical clearance for this study was obtained from Research and Ethics Committee of Federal Teaching Hospital Abakaliki, Ebonyi State of Nigeria. Written informed consent was obtained and confidentiality ensured.

RESULTS

Socio-demographic characteristics: The students were predominately males 115(62.5%) and majority were of the age group 25-29 years 126 (68.5%). Majority of the respondents were in their final year of medical school 112(60.9%) while others 72 (39.1) were in the 5th year class. Majority (86.96%) desired more education on antimicrobial resistance and use.

Majority of the respondents had used antibiotics in the last one year while about half of them had used antibiotics less than 3 times in the last one year. Majority of the medical students surveyed (78.3%) rated themselves to have very adequate/adequate knowledge of antimicrobial resistance and antibiotic use [Table 1].

Table 1: Respondents' previous antibiotic use, knowledge and training on antimicrobials/antibiotics

Variables	Frequency (%)
Used antibiotics in the last one year	
Yes	158 (85.9)
No	26 (14.1)
Number of times antibiotic was used in the last one year	
Less than 3 times	87 (55.1)
More than 3 times	71 (44.9)
Self-rating of antimicrobial resistance knowledge and antibiotic use	
Grossly inadequate	6 (3.26)
Inadequate	8 (4.35)
Fairly adequate	26 (14.13)
Adequate	90 (48.91)
Very adequate	54 (29.35)
Ever been taught on antimicrobials/antibiotics	
Yes	184 (100)
No	0 (0.0)

Majority (70.1%) of the respondents agreed/strongly agreed that poor infection-control practices by healthcare professionals cause spread of antimicrobial resistance. 78.3% had adequate/very adequate antimicrobial resistance knowledge and antibiotic use. Majority (88.1%) disagreed/strongly disagreed that injudicious use of antimicrobials shortens the duration of illness. About half of the respondents agreed/strongly agreed that antibiotics are safe drugs and can be commonly used medication. Majority disagreed/strongly disagreed that skipping one or two doses does not contribute to antibiotic resistance. 69% disagreed/strongly disagreed that adverse effects of antimicrobials are reduced by using more than one antimicrobial at a time [Table 2].

Table 2: Perception of the respondents towards general antibiotic use and infection control practices

Variables	Frequency (%)				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Antibiotics are safe drugs and should be commonly used medication	28 (15.22)	70 (38.04)	12 (6.52)	51 (27.72)	23 (12.50)
Skipping one or two doses does not contribute to antibiotic resistance	13 (7.07)	28 (15.22)	7 (3.80)	55 (29.89)	81 (44.02)
Adverse effects of antimicrobials are reduced by using more than one antimicrobial at a time	14 (7.61)	36 (19.57)	7 (3.80)	64 (34.78)	63 (34.24)
Injudicious use of antimicrobials shortens the duration of illness	8 (4.35)	10 (5.43)	2 (1.09)	55 (29.89)	109 (59.24)
Hand washing is important to the control of antimicrobial resistance	50 (27.17)	36 (19.57)	19 (10.33)	39 (21.20)	40 (21.74)
Poor infection-control practices by healthcare professionals cause spread of antimicrobial resistance	62 (33.70)	67 (36.41)	21 (11.41)	23 (12.50)	11 (5.98)

Majority (66.3%) of the respondents disagreed/strongly disagreed that left-over antibiotics are good to keep at home in case they might be needed later on. Most of the respondents (92.9%) disagreed/strongly disagreed that it is good to be able to get antibiotics from relatives or friends without having to see a doctor. Sixty-nine percent disagreed/strongly disagreed that it would be good to be able to buy antibiotics over-the-counter at the pharmacy/chemist shop. About 50% of the respondents agreed/strongly agreed that antibiotics should be used when one has a sore throat and that antibiotics should be the first drug of choice for sore throat and cough [Table 3].

Table 3: Perception of the respondents towards personal use of antibiotics

Variables	Frequency (%)				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Left over antibiotics are good to keep at home in case they might be needed later on	9 (4.89)	22 (11.96)	31 (16.85)	57 (30.98)	65 (35.33)
It's good to be able to get antibiotics from relatives or friends without having to see a doctor	4 (2.17)	3 (1.63)	6 (3.26)	49 (26.63)	122 (66.30)
It would be good to be able to buy antibiotics over-the-counter at the pharmacy/chemist's	3 (1.63)	32 (17.39)	22 (11.96)	58 (31.52)	69 (37.50)
It is appropriate to use antibiotics when you have a sore throat otherwise you might catch something more serious	24 (13.04)	69 (37.50)	20 (10.87)	44 (23.91)	27 (14.67)
When you have a cough and sore throat, antibiotics are the first drug of choice for early treatment and to prevent emergence of resistant strains	19 (10.33)	50 (27.17)	22 (11.96)	50 (27.17)	43 (23.37)

Overall Grading of Perception: Overall, only 74(40.2%) respondents had a positive perception towards antibiotic use and antimicrobial resistance while 110 (59.8) had a negative perception.

Desire for more education on antimicrobial resistance was associated with perception on antibiotic use and antimicrobial resistance [Table 4].

Table 4. Factors associated with perception to antibiotic use among the respondents

Variable	Perception status		Chi square (x ²)	P-value
	Positive perception	Negative perception		
Sex				
Male	49 (42.6)	66 (57.4)	0.729	0.393
Female	25 (36.2)	44 (63.8)		
Age group (years)				
20-24	12 (31.6)	26 (68.4)	2.034	0.566
25-29	52 (41.3)	74 (58.7)		
30-34	8 (50.0)	8 (50.0)		
=>35	2 (50.0)	2 (50.0)		
Class of Study				
5 th year	47 (65.3)	25 (34.7)	1.486	0.222
6 th year	63 (56.3)	49 (43.8)		
Number of times taken antibiotics in one year				
Less than 3 times	36 (41.4)	51 (58.6)	0.183	0.669
3 times	27 (38.0)	44 (62.0)		
Desired more education on antimicrobial use				
Yes	59 (36.9)	101 (63.1)	5.700	0.017*
No	15 (62.5)	9 (37.5)		
Self rating of AMR knowledge				
Very adequate	29 (53.7)	25 (46.3)	7.478	0.112
Adequate	33 (36.7)	57 (63.3)		
Fairly adequate	7 (26.9)	19 (73.1)		
Inadequate	2 (25.0)	6 (75.0)		
Grossly inadequate	3 (50.0)	3 (50.0)		
Antibiotic use in the last one year				
Yes	63 (39.9)	95 (60.1)	0.055	0.8145
No	11 (42.3)	15 (57.7)		
AMR knowledge rating				
Adequate knowledge	62 (43.1)	82 (56.9)	2.219	0.136
Inadequate knowledge	12 (30.0)	28 (70.0)		

*Statistically significant

Desire for more education on antimicrobials/antibiotic use was a significant predictor of positive perception towards antibiotic use. The odds of having a negative perception towards antibiotic use was 0.64 times lower among those who desired more education on antimicrobial use than those who didn't. (OR 0.36, 95% CI; 0.15-0.87; P=0.024) [Table 5]

Table 5: Logistic regression of factors associated with positive perception to use of antibiotics

Variable	Adjusted OR	95% CI	P value
Desire for more education on antimicrobial use			
Yes	0.361	0.15 - 0.87	0.024*
No			
AMR Knowledge rating			
Adequate knowledge	1.721	0.80 - 3.68	0.165
Inadequate knowledge			

*Statistically significant

DISCUSSION

Our study assessed the perception of medical students towards antibiotics use and antimicrobial resistance. Majority of the respondents (85.9%) had used antibiotics in the last one year. This high prevalence of antibiotic use is similar to the report of previous studies.^{14,15} About half of them had used antibiotics less than 3 times in the last one year.

Majority of the medical students surveyed (78.3%) rated themselves to have very adequate/adequate knowledge of antimicrobial resistance and antibiotic use. Despite this high rating on knowledge, greater proportion of the medical students had overall negative perception towards antibiotics use and resistance. Our finding differs from that seen in a study carried out among faculty and resident physicians in a tertiary hospital in Florida where majority of the respondents had good perception.¹⁶ This disparity could be due to the fact that the study in Florida was among physicians who were already practicing. About half of the medical students in our study wrongly believed that antibiotics are safe drugs and should be commonly used. This is in agreement with a study carried out in India¹³ but differs from another study in India where 78% of the medical students disagreed with this belief.¹¹

Most (70.1%) of the respondents correctly identified that poor infection-control practices by healthcare professionals can cause spread of

antimicrobial resistance. This finding is similar to a study carried out among medical students in tertiary hospitals in China.⁸ This similarity may be explained by the fact that both studies were carried out among medical students who are already at the clinical stage of their training. Only 46.7% of the respondents agreed that hand washing is important to the control of antimicrobial resistance. This is in contrast to a study among French medical students where majority agreed that hand washing was important in the control of antimicrobial resistance.¹⁷ This is particularly worrisome given the critical role of hand washing in infection prevention and control in health care settings. There is need to emphasize the role of hand washing in lectures on infection control for medical students. In spite of this, majority (70.1%) of the respondents rightly perceived that poor infection control practices by health workers could cause spread of antimicrobial resistance.

Majority of the medical students rightly disagreed that injudicious use of antimicrobials shortens the duration of illness. This corroborates the findings of a study carried out in India among second year medical students.¹³ Correct and judicious use of antibiotics is of great importance in achieving clinical effectiveness. The study also revealed that many of the respondents did not agree that the adverse effects of antimicrobials are reduced by using more than one antimicrobial at a time. This shows their good perception of antibiotics use. However, this finding differs from that in India.¹³

The disparity may be because the study in India was carried out among medical students at a lower level who may not have received lectures on antibiotics use. About half of the respondents reported that antibiotics are safe drugs and can be commonly used medication. Similarly, another study conducted among medical students also found that they opined that antibiotics should be consumed commonly.¹³

This is a wrong perception that should be corrected among would-be doctors (antibiotic prescribers) given the growing menace of antibiotic resistance globally. Antibiotics should not be seen as medications that should be commonly used as this would inadvertently encourage injudicious use.

Although the medical students correctly disagreed with some misperceptions of antibiotics use, a few of them (26%) still wrongly assumed that skipping one or two doses does not contribute to antibiotic resistance. This finding is similar to previous studies carried out in India where some of the respondents believed that skipping one or two doses does not contribute to antibiotic resistance.^{11,13} Majority of the respondents correctly identified that left-over antibiotics should not be kept at home in case they might be needed later. Most of them also reported that it is not good to get antibiotics from relatives or friends without having to see a doctor and that it is wrong to be able to buy antibiotics over-the-counter. This good perception towards antibiotic use is necessary for good practice and will help improve effectiveness and reduce antimicrobial resistance since people will only take antibiotics when it is prescribed by a qualified health personnel. A similar study in Italy showed that majority of the respondents had good attitude and behaviors towards antibiotics use.¹² About 50% of our respondents believed that antibiotics should be used when one has a sore throat or a cold. Such beliefs may lead to wrong practice which can result in antibiotic resistance. This finding is similar to the result of previous studies^{11,13} but differs from a study carried out among medical students in Italy where almost all the students interviewed stated that they usually do not take antibiotics for flu or cold or a sore throat.¹²

Majority of the medical students desired more education on antimicrobial resistance and use. This finding is in accordance with previous studies.^{8,18} Medical students are an important target group for prevention of antimicrobial resistance since they are the upcoming physicians. Medical students in their last 2 years before graduation require proper and intensive education on antibiotics use and resistance. This will help improve their practice regarding antibiotics since they will soon graduate and assume responsibility of patient care decisions. Desire for more education/knowledge on antibiotic resistance and use was found to be associated with positive perception. The odds of having a negative perception towards antibiotic use was lower among those who desired more education on antimicrobial use than those who didn't. Antibiotic resistance is an important issue globally and needs to be addressed urgently.

Judicious use of antibiotics is one sure solution to the problem of antibiotics resistance and medical students who are the future physicians have a vital role to play and must not be overlooked.

Firstly, to the best of our knowledge, it is one of the few studies that have investigated the perceptions regarding antibiotic use and antimicrobial resistance amongst medical school students in South-Eastern Nigeria. Secondly, all the students involved in this study completed their questionnaires resulting in a high response rate. The use of self-report could have introduced potential bias into the study however anonymous participation was ensured to minimize socially desirable answers.

CONCLUSION

There was poor perception towards antibiotic use and resistance among the respondents in spite of the adequacy of self-rated knowledge on antimicrobial use and resistance. There is need for reorientation of medical students towards antibiotic usage and the role of infection control so as to encourage antimicrobial stewardship.

Acknowledgment:

We acknowledge all the medical students who participated in the study.

Conflict of Interest:

The authors do not have any conflict of interest to declare.

REFERENCES

1. Cosgrove SE. The Relationship between Antimicrobial Resistance and Patient Outcomes: Mortality, Length of Hospital Stay, and Health Care Costs. *Clinical Infectious Diseases* 2006;42(Supplement_2):S829.
2. Adisa R, Fakeye TO, Aindero VO. Evaluation of prescription pattern and patients opinion on healthcare practices in selected primary healthcare facilities in Ibadan, South-Western Nigeria. *African health sciences* 2015;15(4):131829.
3. Asogwa I, Offor S, Mbagwu H. Knowledge, Attitude and Practice towards Antibiotics Use among Non-medical University Students in Uyo, Nigeria. *Journal of Advances in Medical and Pharmaceutical Sciences* 2017;15(1):111.
4. Igbeneghu OA. Knowledge and practices in the use of antibiotics among a group of Nigerian university students. *International Journal of Infection Control* 2013;9(1).
5. Ghadeer A. R. Y. Suaifan, Shehadeh M, Darwish DA, Al-Ije H, Yousef A-MM, Darwish RM. A cross-sectional study on knowledge, attitude and behavior related to antibiotic use and resistance among medical and non-medical university students in Jordan. *African Journal of Pharmacy and Pharmacology* 2012;6(10):76370.
6. Pulcini C, Cua E, Lieutier F, Landraud L, Dellamonica P, Roger PM. Antibiotic misuse: a prospective clinical audit in a French university hospital. *European Journal of Clinical Microbiology & Infectious Diseases* 2007;26(4):27780.
7. Thriemer K, Katuala Y, Batoko B, Alworonga J, Devlieger H, Van C, et al. Antibiotic Prescribing in DR Congo: A Knowledge , Attitude and Practice Survey among Medical Doctors and Students. 2013;8(2):29.
8. Yang K, Wu D, Tan F, Shi S, Guo X, Min Q, et al. Attitudes and perceptions regarding antimicrobial use and resistance among medical students in Central China. *SpringerPlus* 2016;5:1779.
9. García C, Llamocca LP, García K, Jiménez A, Samalvides F, Gotuzzo E, et al. Knowledge, attitudes and practice survey about antimicrobial resistance and prescribing among physicians in a hospital setting in Lima, Peru. *BMC Clinical Pharmacology* 2011;11(1):18.
10. World Health Organization. The evolving threat of antimicrobial resistance [Internet]. Geneva: 2012 [cited 2018 Jun 23]. Available from: <http://apps.who.int/iris/handle/10665/44812>
11. Khan AK, Banu G, Reshma KK. Antibiotic Resistance and Usage A Survey on the Knowledge , Attitude , Perceptions and Practices among the Medical Students of a Southern Indian Teaching Hospital. *Journal of Clinical and Diagnostic Research* 2013;7(8):16136.
12. Scaioli G, Gualano MR, Gili R, Masucci S, Bert F. Antibiotic Use: A Cross-Sectional Survey Assessing the Knowledge , Attitudes and Practices amongst Students of a School of Medicine in Italy. *PloS one* 2015;10(4):e0122476.
13. Mahajan M, Dudhgaonkar S, Deshmukh S. A Questionnaire based Survey on the Knowledge , Attitude and Practises about Antimicrobial Resistance and Usage among the Second year MBBS Students of a Teaching tertiary care Hospital in Central India. *International Journal of Pharmacological Research* 2014;4(4):1759.
14. Kehinde OO, Ogunnowo BE. The pattern of antibiotic use in an urban slum in Lagos State, Nigeria. *West African Journal of Pharmacy* 2013;24(1):4957.
15. Omulo S, Thumbi SM, Lockwood S, Verani JR,

- Bigogo G, Masyongo G, et al. Evidence of superficial knowledge regarding antibiotics and their use: Results of two cross-sectional surveys in an urban informal settlement in Kenya. 2017;113.
16. Abbo L, Sinkowitz-cochran R, Smith L, Arizaheredia E, Srinivasan A, Hooton TM. Faculty and Resident Physicians Attitudes, Perceptions and Knowledge about Antimicrobial Use and Resistance. *Infect Control Hosp Epidemiol* 2011;32(7):7148.
 17. Dyar OJ, Howard P, Nathwani D, Pulcini C. Knowledge, attitudes, and beliefs of French medical students about antibiotic prescribing and resistance. *Medecine et Maladies Infectieuses* 2013;43(10):42330.
 18. Minen MT, Duquaine D, Marx MA, Weiss D. A Survey of Knowledge, Attitudes, and Beliefs of Medical Students Concerning Antimicrobial Use and Resistance. *Microbial Drug Resistance* 2010;16(4).